Segmental Neuropathy

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The First Evidence of Developing Pathology

Dedication

The greatness of Chiropractic lies within its principles. The ignominy of Chiropractic lies in ignoring those principles, and accepting less effective substitutes. This book is an attempt to restore dignity and honor to the man whose brilliance as a thinker and writer has been overshadowed for too long. This effort therefore, is dedicated to:

D. D. Palmer

with the hope it will quicken the hearts of those who have grown faint in the pursuit of the truth of Chiropractic.

Acknowledgments

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The Science of Chiropractic

The science of Chiropractic has modified our views concerning life, death, health and disease. We no longer believe that disease is an entity, something foreign to the body, which may enter from without, and with which we have to grasp, struggle, fight and conquer, or submit and succumb to its ravages. Disease is a disturbed condition, not a thing of enmity. Disease is an abnormal performance of certain functions; the abnormal activity has its causes, as much so, as the windows which are bound and cease to be movable, or the transoms and doors which we are unable to close, because of the settling of some portion of the building. The morphological alterations of the body superinduced by displaced structure can be located and as surely corrected as can the sagging of the building. Disease is manifested by functional aberrations and structural alterations. These constitute the signs, symptoms and lesions of a departure from a state of health. Disease does not involve any new functional expression which the body does not already possess; it is only a change in the amount of energy and function performed. The body in disease does not develop any new form of energy; what it already possesses is diminished or increased, perverted or abolished. In health there is a constant physiological, invincible molecular change – the manifestations of energy. In disease this manifestation of energy is modified and the quality of structure is altered. The transmission of physiological impulses in normal amount is health; in a less or greater degree, disease. Physiological metabolism is health; pathologic metabolism is disease."

With this view, it can be stated that optimum health may be compared to a delicately poised high-wire artist who maintains his balance by incessant identification and compensation for minute changes in his position. In contrast to this comparison, the spinning top, stable in its own inertia, slowly wobbles to a stop if more speed is not injected periodically.

Every puff of breeze, every twitch of wire, every thousandth of a step disturbs the status quo and demands immediate response by the performer. This response must be instantaneously and perfectly judged, otherwise swaying, which is inevitable, becomes uncontrollable – then he topples. Thus it is in your body: every system, every organ, every fiber, every cell is in a state of constant flux, adapting to the changing stress of environment. This activity, exhibiting intelligence*, does not ebb passively to and fro like seaweed in the tide. All indicating mechanisms must constantly be engaged in identifying the full range of all actions.

* The term intelligence is used in this manuscript not in the sense of the intelligence of the cerebral cortex of man, but rather in the context of the cellular, biological intelligence that distinguishes living from non-living things. It implies the capacity to choose the correctly graded responses necessary to adapt to constantly fluctuating levels and complexly interwoven patterns of changing circumstances.

Health requires integration of a multitude of functions developed and performed correctly, not only individually, but more importantly in terms of the sum total of all activities required by the body. Dependable balance or biological control requires an intricate system of communication for intelligent integration. The activity of each separate part must be inter-related with every other part. Each action and reaction must be modified according to an intelligent "pattern" or "design" as the highest attainable expression of life. These intelligent behaviour patterns are held in the memory core of the nervous system for the entire spectrum of functional balance. This is true for the most complicated as well as the most fundamental acts which the organism may need to perform. Such a storehouse of information provides for an intelligent response which is inherently competent to maintain not only self-preservation, but improvement.

The nervous system monitors not only extrinsic functions, but controls inherent function, protecting itself from imbalance with a precision no man-made electronic computer is ever likely to approach.

The eye, for example, is a self-contained photo-lab which processes motion pictures of the finest clarity, developing them in milli-seconds. It is so unbelievably sensitive that it will respond to a single quantum of energy – the theoretical smallest particle into which energy can be subdivided. In everyday terms this means the ability to see a candle flickering at a distance of five miles in perfect darkness. Yet, this same eye can discriminate between grains of sand in the Sahara desert at noon.

To confound the imagination further – even as the eye is alerting the brain to approaching objects, some of which imply danger, the nervous system is monitoring the eye itself to control the amount of light which needs to be admitted.

The body's response to infection is also under the control of the nervous system. Bacterial "invasion" can impose specific forms of irritation onto tissue in ways which damage the cellular structure beyond the limits of its normal spectrum of adaptability, wherein the expression of life becomes impossible. Yet, infection in the great majority of instances is contained within a circumscribed area.

Even at the moment of invasion the nervous system is intimately involved in the "battle" between micro-organism and tissue cell, setting into motion neural discharges which identify the specific character of the irritation or injury. Such information plays the leading role in the ultimate design of specific reactions which contain and destroy the invader. Information regarding the entire episode is stored in the nervous system as a defense mechanism of functional behaviour specifically designed to increase the body's resistance to possible future re-infection by the particular micro-organisms.

An example of how the nervous system acts to impart immunity to bacterial invasion can be illustrated experimentally through the reaction known as active local immunization.

If the skin of an animal is exposed to "antigen" for approximately 24 hours prior to an experimental live virus innoculation, the virus will be unable to overcome the defence mechanisms of the tissues. If, however, the nerve which monitors the sensory field of the exposed skin is destroyed prior to application of antigen, local immunity will not develop. Innoculation with live virus under these conditions will produce severe infection. Health may therefore be said to represent an intelligently controlled balance between forces of stress, and the ability to adapt.

This balance can be toppled from two directions. The external stress can so overwhelm the tissues that no amount of internal nervous adaptation can absorb the shock, and damage to the tissues will result. In contrast, the internal nervous component of control of all cellular activity can be changed in such a way that the full range of tissue adaptability to stress is reduced, seriously impairing the body's maximum defense potential.

The explanation of disease as a failure of adaptation to environment is perhaps the most significant concept to come out of medicine in this century. This concept contradicts the premise that every "named" disease has a separate etiology; reiterating the far more dynamic idea that each disease has a common denominator with all others; to repeat, failure of adaptation within the organism. However, to qualify the above statement, it is not the intention of this work to ignore the existence of recognized environmental factors that contribute to the establishment of a peculiar pathological condition that gives a "disease" its appearance as a classical entity.

Certainly it is obvious that a renal disease will have different clinical manifestations in comparison to a pulmonary disease, but this is simply because the functions of these organs are entirely different. Should a patient die of a kidney disease, it is because no other organ can adequately compensate for, or adapt completely to, the loss of renal function. Essentially the patient dies from inadequate adaptation to the renal problem. This same state of affairs applies to the pulmonary disease reference and to every other organ pathology.

Diagnostically, it is important to gauge the degree of malfunction in a given organ or system, primarily to commit or set up adequate patient management, which will minimize the effects of the stress produced by the malfunction. For this reason, and to this extent, commitment to standard orthodox diagnostic procedures is required. It is admitted that while knowledge of the individual organ or function in pathology is vital for proper

patient management, what is more important by far is to evaluate properly the nature of the failure of adaptation itself. This work pioneers this concept realistically. It will be shown that adaptation is the functional response of integrated neural control, and when adaptation fails, it is a sign of loss of neural control.

The Subluxation - a symptom of Neural Dysfunction

The principle of chiropractic, theorized around the outdated classic model of nerve root compression – the impingement of nerves within the intervertebral canal or foramina of the spinal column as the originating factor in most disease processes – served well during the developmental era of chiropractic. The concept of this impingement causing a supposed physical interference with the normal transmission of nervous impulses, also served well during this era. Both hypotheses had the great merit of providing a plausible explanation on which the actual practice of chiropractic was based.

There is growing evidence that in the majority of instances the "interference" which chiropractors have been correcting with varying degrees of success for the past 70 years is not satisfactorily explained by the two above-mentioned hypotheses.

It now seems more likely that the vertebral subluxation, rather than being the static cause of disease, can play a dual role. It may both initiate and/or reflect neural dysfunction, manifesting itself both as a cause and a symptom of a more profound disturbance deep within the nervous system.

Interference as we now understand it is neither a blockage nor an abnormal stimulation of the normal nervous impulse. Rather, it appears that that which is corrected is a build-up of neurological dysfunction which, once set into motion through various stress factors, is capable of existence without further abnormal irritation. Having once reached this state of development, abnormal function becomes a reflection of established abnormal neural control. In its superficial aspects, it is observed as a zone of reflex aberration; a change in the mode or design of appropriate response to normal stimuli. In its totality, it may represent a completely new nervous system, programmed on modified premises, responding in abnormal function, unable to integrate normal defense mechanisms, and even ultimately initiating its own pathologies.

The observation that the existing vertebral subluxation is secondary, at least in advanced disease processes, to some other more deeply-seated cause, has long eluded investigators due to a lack of appropriate systems of analysis, for observing the phenomena which deny the primacy of the subluxation postulate. This is not to deny the primacy of the subluxation in the initial stages of a neuropathic* process. Quite the contrary, evaluation of clinical data indicates the "mechanical-neural" stress complex can be artificially created instantaneously without producing any noticeable change in musculo-skeletal

* Neuropathy as used in this text is defined as any derangement of neural activity.

organization. Even though there is a spontaneous and automatic reaction in such an event such action is seen to be quite capable of producing a reaction of sustained neural dysfunction in geographically associated elements of the neuromere. It is reasonable to suppose that some neural elements are, for one reason or another, more susceptible to rapidly changing stress complexes than other tissues such as those which form the composite of intervertebral articular substance and neurodokon.

From these observations it is possible to theorize that a "primary" subluxation is in fact the initiating factor of the segmentalized neuropathy. It is now understood that it is only necessary for the subluxation to be present momentarily, from a historical standpoint, to initiate a type of injury to neural elements whose latency of repair of such injury is extended in time beyond the more spontaneous recovery of the musculo-skeletal strain of the articulation. It must be remembered that the neural processes which the subluxation initiates contains internal stresses which, in future development, can produce diffuse, and seemingly unassociated, far-reaching functional aberrations. It is doubtful, therefore, that what is judged in the clinical examination of the patient to be a subluxation is ever the initiating cause of the disease process. The observed spinal abnormalities are more likely the products of a neurological disintegration of structural control – an advanced stage of a process proceeding throughout the nervous system – originating from the point in time of its original creation.

Unless advances are made beyond old mechanical concepts, into concepts embracing the neurological factors associated in the disease process, one finds it difficult, if not impossible to explain the great paradox of chiropractic – that different adjusting techniques, based on conflicting premises, often produce the same impressive clinical results.

The vertebral subluxation becomes more subtly understandable when viewed as a symptom of an aberrant postural reflex which is normally inter-segmentally associated through nerve networks located on each spinal cord level. Such sensory-motor neural control must be totally integrated to produce coordinated motion in the spinal column as a whole unit. The etiology of the vertebral subluxation may well be physiological or mechanical trauma to the proprioceptive fibers, a neurological insult to the nervous control mechanisms servicing the articulation. This action would result in a deranged appreciation by the appropriate spinal and cerebral centres of the position in space of the respective vertebrae.

It is, therefore, an over-simplification to interpret the muscular splinting which accompanies injury to the spinal articulation as being a mere facet of a normal defense and repair mechanism. It is more likely that such behaviour should be recognized as one of the

manifestations of the sequential development of the independent neuropathic entity. Similarly, insulin injections are followed by a drop in blood sugar level if the nervous system is functioning normally, but initiate no change at all in blood sugar level while the nervous system is anesthetized and thereby unresponsive. Potassium cyanide in lethal dose will cause convulsions and sudden death through the neuropathy initiated in a responsive nervous system, but an anesthetized animal shows no symptoms at all. The poison is excreted in the saliva and the animal arouses from the anesthesia quite unharmed. Likewise, the the majority of clinical symptoms, fever, changes in blood count, and even antibody production are all the results of nervous reflex action. Caution must be taken in the evaluation of local signs of dysfunction, since it is difficult under the best clinical conditions to distinguish accurately between functional derangement reflecting abnormal neural control, and either extreme of hyper- or hypo-function within the normal range of controlled adaptability.

Sequential Development of the Neuropathy

Chiropractic theory equates any deviation in mechanical co-ordination of physical movement between spinal segments as evidence of a functional derangement of primary importance in any disease process.

In order to understand the new objectives of a chiropractic analysis, it will be necessary to define the role of physiological indicators in the diagnosis of a localized neuropathy and posit the classification of forms of neuropathy. This will enable us to present the hypotheses of the mechanics of the disease process as it might appear in classic form.

Definitions of the following types are not intended to be so wide as to embrace variations which admittedly occur outside such theoretical classification. They are intended only to aid the reader in understanding the underlying principles.

Through the full spectrum of functional derangement, from simple fatigue at one extreme, to advanced degenerative diseases at the other extreme, there is one common denominator – neural interpretation of stress of cellular activity, either structural or functional, via direct or indirect communication.

The nervous system, acting in its capacity as coordinator of all functional activity, exhibits a high degree of adaptability to a wide range of micro-trauma or physical insult to its integrity. It is of interest here to attempt only a classification of the events which follow the stress-insult of injury which exceeds the normal adaptative capacity of such functional integrity.

Two mechanisms of neural control – vasomotor control of thermal regulation and spatial or positional orientation of spinal movement – are used as indicators of the efficiency of adaptation to stress. Both mechanisms have been part of the chiropractic diagnostic armamentaria since its inception. The state-of-art has steadily progressed, and present evaluation is a continuum of earlier explorations.

The degree to which each of these systems of neural control is capable of producing a uniform and appropriate response to thermal and mechanical stress stimuli is known to be indicative of the progression or regression of any disease process.

Using these mechanisms as isolated examples, a sequence of events can be described which may follow a stress-insult of injury. These events have been evaluated in the past decade from clinical data.

It must be understood that it is only for academic reasons that there is justification to try to divide or isolate nerve circuits according to the functions which they perform. At no time is it permissible to speak of independent nerve circuit action, since the basic function of neural control is total integration of all functional activities.

Classification of the forms of neuropathy of segmental reflex mechanisms can be made according to type and kind of resultant dysfunction of elements controlled by such mechanisms.

Three major divisions of "stress-insult" may be identified;

1. Micro-trauma of cellular tissue (as opposed to nervous tissue).
   The injury of stress damages tissue beyond its capacity for the immediate recovery of its bio-chemical equilibrium, and this requires time for repair. Neural control "recognizes" such injury by reducing functional demands and initiating responses which set the organism on "guard" against future exposure to new trauma, i.e., local inflammation.

2. Trauma extensive enough to damage nerve endings.
   Injury to nerve tissue is of far greater significance than injury to any other type of tissue as it has the potential capacity to modify the neural image of appropriate control of functions which are contained within the nerve circuits with which it is connected, for example, the entire neuromere. Whether or not a given injury will produce a neuropathic change in nervous function appears to be dependent on the following:

   (a) The order of prime importance of the function under control of the neural network containing the injured elements.

   (b) The degree of dependency on summation between inter-segmental links of a given reflex mechanism necessary to produce co-ordinated impulse characterization.

   (c) The number of fibers affected in the injury.

   The probability of the neural elements degenerating sufficiently to establish a neuropathic behaviour can be estimated by consideration of these three factors.

3. Referred, or second-order trauma.
   In so far as every hypothetically discrete neural reflex mechanism is in reality interrelated and interdependent with other reflex mechanisms,

traumatic dysfunction in one zone will result in some degree of aberration in associated zones. The degree of aberration will depend on the strength of association and this will be symptomatically interpreted in hyper- or hypo-function, depending on the innate nature of the individual mechanisms to stimulate or inhibit.

Micro-trauma, the first classification, could, under different circumstances, be included within the normal range of adaptation. However, it is listed as the first phase of a neuropathology for the obvious reason that in most instances a stress episode is composed of a series of injurious events occurring almost simultaneously. Placing the organism on "guard" therefore, only acts to set the stage on which the neuropathy can develop; locating the neural components on centre stage, so to speak, in a manner which makes such components extremely vulnerable to injury.

As noted in number two above – local nerve trauma – the primacy of the function under control is an important factor in the consideration of the probability of establishing a neuropathy in a reflex mechanism. In the emergency type reactions to stress, either localized or general, primary functions (such as vasomotor control of blood volume and distribution, tone of digestive tract, secretion of hormones, conversion of stored energy, and the increase of sensory and motor responsiveness) dominate the neurological scene increasing the probability of their being injured by subsequent stress factors.

It is imperative that the reader be able to distinguish the difference between the deviation in function as classified in number one and number three (local or distant) above, and number two. Number one and number three in reality, represent only a restriction or incoordination of neural activity. Number two represents the distinct loss of functional identification and control of peripheral tissues, all of which results from cellular damage of a neural control mechanism.

A distortion of the neural imagery contained within a nerve circuit will be shown to exhibit the capacity to exist as a separate and distinct entity in comparison to its previous integration with associated networks. Peripheral manifestation of its existence is always observed as a complete dissociation between the neural mechanism and the cellular elements normally under its control. We will demonstrate that this becomes the self-perpetuating vicious cycle – with or without the local subluxation within the cycle.

Regardless of the manner in which it was set into motion (thermal, mechanical or chemical stress) the segmental neuropathy, once established becomes self-supporting in the sense that the initiating factor need not remain as part of the abnormality for the process to continue to exist and extend itself.

Such a peculiar characteristic behaviour defies any explanation based on old concepts; explanations which are still in vogue today to describe this type of neuropathy. The popular concept of nerve "lesion" as used in orthodox medicine, or nerve pressure, once commonly used in chiropractic to explain dysfunction of a motor unit as muscular activity for example, more aptly defines the "side effects" of normal neural components to abnormal stress. They have been forced into extremes of functional adaptation simply by being in contact with the neuropathy. Continuous strain is imposed onto these associated networks until a new conditioned reflex of the total complex is impressed as a new behaviour pattern upon the central nervous system.

Deviation from the normal range of neural co-ordination usually results in a diminution of control of respective functions. It is as though the nerve networks become insensitive to fine increments of functional changes under their control. The total process – the neuropathic element, and constellation of associated aberrant neural mechanisms – progresses toward higher degrees of abnormality or regresses to dissolution and return to normal depending on the degree of strain produced on the organism and the inherent ability of its adaptation.

Early in the development of chiropractic it was as difficult to explain clinical successes as it was to explain clinical failures, because the theories were based on orthodox concepts of neurology and pathology.

Orthodoxy denies the existence of a qualitative factor superimposed on the quantitative response of a neuron to a given stimulus. Yet clinical evidence illustrates the role of deranged neural function in the eventual debility of any organ or tissue. In the eighteenth century, researchers recognized that a damaged or injured nerve element was potentially more dangerous, from the standpoint of ultimately producing degeneration and pathologies in the tissues supplied by the nerve, than complete severance or immediate destruction of the nerve. Although a qualitative tone to the impulse would aid in explaining neural interpretation of varying stimuli, qualitative characteristics have not been observed through experimentation. While measurements are not yet fine enough to prove such a conjecture it is the present belief that qualitative characteristics are an inherent property of all neural activity. It is this factor which ultimately brings to reflex neural control an image of the cellular behaviour of the tissues in which most nerve fibres terminate at the periphery.

As cellular bio-physical and bio-chemical behaviour moves through the entire spectrum of processes concerned with its normal adaptability to stimuli, the tone of neural response (to stimuli for which it is specifically sensitive) is modified. A graded variance

of neural tone could be estimated to affect the conduction velocity of the impulse. It is reasonable to suppose that the conduction velocity of impulse transmission would reach its highest value at the center of the spectrum of cellular activity wherein optimum physical and chemical equilibrium exists. Above or below this optimum it is equally reasonable to suggest that the conduction velocity will diminish in decrements to a base value. It is probable that one of the reasons that such changes in conduction velocity have not been observed, is due to the fact that stress associated in the methods of experimentation have reduced the elements to this base value.

For our purpose it is sufficient to use the antidromic impulse associated in the vasomotor control of dilatation of blood vessels in the skin as a model which quite adequately describes the neural capability of qualitative action. The neural mechanism of motor-receptor units, designed to control function, has, in addition to "memory" of the appropriate response to specific demands, an impressed image of the cellular physio-chemical characteristics peculiar to the specific tissues involved in the given function.

The biological integrity of any tissue is identified through its cellular response to the command of the nerve impulse. It is, in effect, controlled by the specificity of that impulse which is created and generated by neural elements containing the image of that tissue.

Final decision on the validity of this hypothesis must at this time be left to the future. It is more important to satisfy the purpose of establishing this concept – to give meaning to chiropractic principle and a better understanding of its clinical application. Having described the neuropathy of any neural mechanism as the primary locus for deranged function there remains only a need for description of the role of such a neuropathy in pathology.

In 350 B.C. Aristotle considered the warmth of the body to emanate from the heart. Fever then resulted from an abnormal heart action. In 1648 vital spirits were cited as the cause. About 1773 friction of the blood was named. That the central nervous system was an influencing factor was not discovered until 1852 when the vasomotor control mechanism of thermoregulation was described. Fever is accepted today as resulting from the "setting" of the human thermostat in the brain at a higher value, adjusting vasomotor function accordingly. There still remains the question as to why the thermostat behaves in this manner. Reasons are advanced that a fever state is a natural defense mechanism in combating infection. Others wonder at the role of toxins circulating in the blood stream as possibly being the contributing factor deranging the central control of thermoregulation.

From our foregoing definition of the form of neuropathy observed on segmental levels of the spinal cord, one must now recognize clinical evidence of generalized hypertension of the small arteries of the skin, and relative hypo-tension of the superficial capillary bed in fever states as exhibiting the same type of behaviour as seen in the segmental derangement. That fever is associated with infectious diseases, toxemias etc., cannot refute the primacy of the neural involvement as being a first order of pathological events. This neural involvement only identifies the bacteria or toxin as a nerve irritant or as an element in the advanced stages of a pathological process which has expanded unobserved through successive stages of debilitating associated neural mechanisms concerned in the process of immunity. The bacterium, virus or toxin "invades" the organism and a "battle" between organism and invader ensues. The presence of an "invader" and the pathological forms which the "battle" may take are valuable only as indicators of the course and development of the final stages of the pathological process, (the debilitation of neural control). If there is an "invader" it is the original segmental neuropathy. If there is a "battle" between organism and invader it is a battle fought deep within the nervous system between the original neuropathy and "healthy" associated neural mechanisms of control. The appearance of the microbe only testifies to the fact that the original neuropathy was successful in debilitating associated healthy mechanisms, thus extending its influence throughout the nervous system to involve the processes of immunity.

Just as fever and the microbe are indicators of the extension of the neuropathy throughout the nervous system, similarly, symptomatology of all other functional derangements or pathologies can now be viewed as indicators of neurological aberration. Classification of symptoms into diseases would serve a more worthwhile purpose if such classification was directed toward the evaluation of the particular course of development which the neuropathy was taking in its extension into associated fields of neural control.

Segmental Neuropathy of Thermal Regulation

In our study and use of skin temperature as an analytical indicator of abnormal nerve function we qualify any interpretation of our findings with a full appreciation of the complexity of the interactions of the physical, chemical, and neural mechanisms involved with heat transfer.

Considerable research data has been compiled on the subject of skin temperature and its rate of change under various physical and physiological conditions. It is not the purpose of this paper to give the reader a detailed resume of all experiments performed in this field, but rather to list, as simply as possible, certain well substantiated facts which bear directly on our system of analysis.

In the study of skin temperature it is understood that definite physiological and natural laws are involved which impose certain limitations to the practical use of this type of analysis. Because of this, it is well at the beginning of this study to realize the fundamental factors involved in the thermal exchanges existing between Man and his environment. These may be listed in the following main categories:

1. HEAT PRODUCTION – Tissue metabolism; the source of all heat production.

2. HEAT LOSS – Factors involved in heat transfer and dissipation.

For our purpose it is convenient to define metabolism as the process of energy transformation within the body, whose chief product is heat. Factors such as the simple ingestion of food, muscular activity, emotion, and certain dis-ease conditions will influence the metabolic rate and thereby change important relationships which exist between heat production and heat loss. It is understood that the internal body temperature must at all times represent the balance struck between the heat produced by metabolism and the heat lost to the environment.

Before attempting to explain the avenues through which heat is lost or dissipated to the environment and the factors which will influence this loss, it is desirable to include at this point a basic explanation of HEAT.

Sensory organs of the skin provide man with a rough subjective measure of temperature, but for scientific purposes a more exact temperature scale is required. *Measurements of temperature are based on the observation of changes in physical quantities*, e.g. the length of a column of mercury in a thermometer, which, because of thermal expansion, increases with temperature. Observation of the pressure in a fixed volume of gas also gives us a temperature scale, and illustrates an important principle of thermodynamics – *Heat is a form of energy*. As we put heat into the gas its molecules move more rapidly, i.e.

their energy increases, and their greater force of impact on the walls of the container produces an increase in pressure.

A simple definition of temperature is obtained by saying that heat flows from places of higher temperature to places of lower temperature. We must now look at the various ways in which such a transfer can occur. Imagine a cold box with a very hot object suspended inside it by means of a metallic wire. Suppose we have a vacuum inside the box. The object loses heat by *radiation*, i.e. heat flows to the walls in the form of electromagnetic waves. Radiation is the process by which heat reaches the earth from the sun. The object also loses heat by *conduction*, since the ends of the metallic suspending wire are at different temperatures, and heat flows along the wire from the higher to the lower temperature. An important difference between the two processes is that conduction only takes place through matter, whereas radiation can travel through a vacuum. Let us introduce gas into the box. The gas near the object is heated by contact with it, and rises, thus carrying heat away from the object. This process is called *convection*, and the so-called radiators used for indoor heating use this process.

When we have gas in the box, the three modes of heat loss are all present together. An important experimental result is *Newton's law of cooling*, which states that the rate of loss of heat of an object is directly proportional to the temperature difference between the object and its surroundings.

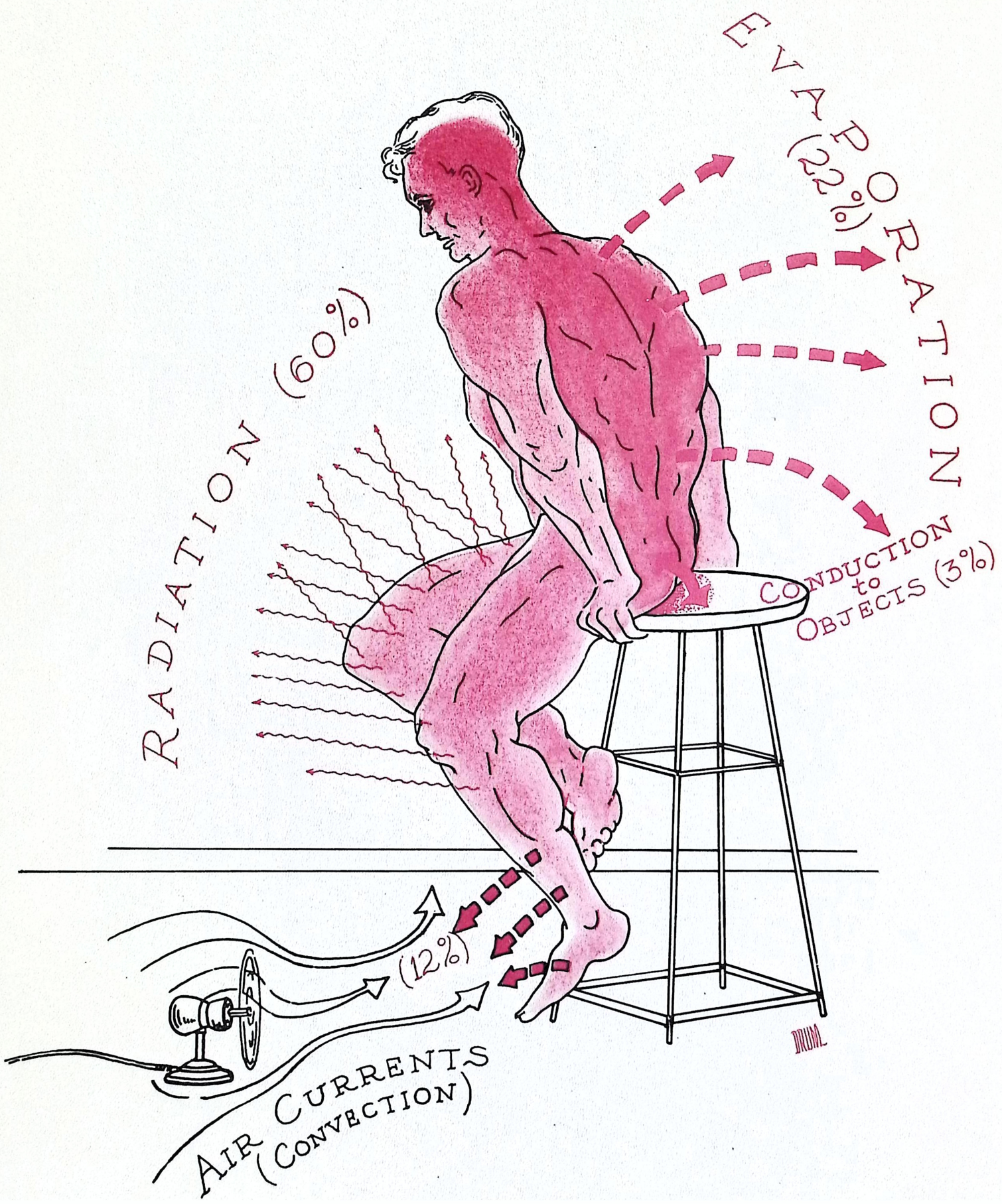
The human body uses the above three ways of heat transfer, and also the process of evaporation (in sweating). The process is illustrated by putting ether on the skin. A cooling is felt, since the rapidly evaporating ether carries away heat with it. The relative contribution of the various processes to the cooling of the human body depends on the environment.

A given material may be characterised, as far as heat flow properties are concerned, by giving its *specific heat and thermal conductivity*. If we heat one gram of substance through one degree Centigrade, the amount of heat we put into the gram is defined to be the *specific heat* of the substance, and the unit of heat employed is the *calorie*, which is the amount of a heat involved if we use water as the substance. Thus specific heat is given in terms of calories per gram.

When conduction occurs it is found that the amount of heat flow per unit area through a substance is proportional to the temperature gradient, i.e. the rate of decrease of temperature with distance, and to a quantity called the *thermal conductivity* of the substance.

Suppose we have a wall of material with the same temperature on both sides, and we suddenly increase the temperature on one side. Heat begins to flow through the walls, at a rate proportional to the thermal conductivity of the wall material. As heat reaches the interior regions of the wall, they begin to heat up, at a rate which depends on the specific heat of the wall material. Finally, a state of *thermal equilibrium* is reached, in which the temperature does not vary in time but varies smoothly through the wall, while heat passes through the wall at a fixed rate, which is proportional to the temperature difference across the wall and the thermal conductivity, and inversely proportional to the wall thickness. The final rate of heat flow depends on the thermal conductivity, but the time taken to reach equilibrium will increase with the specific heat, since the heat flow can slowly heat up the wall if the specific heat is high.

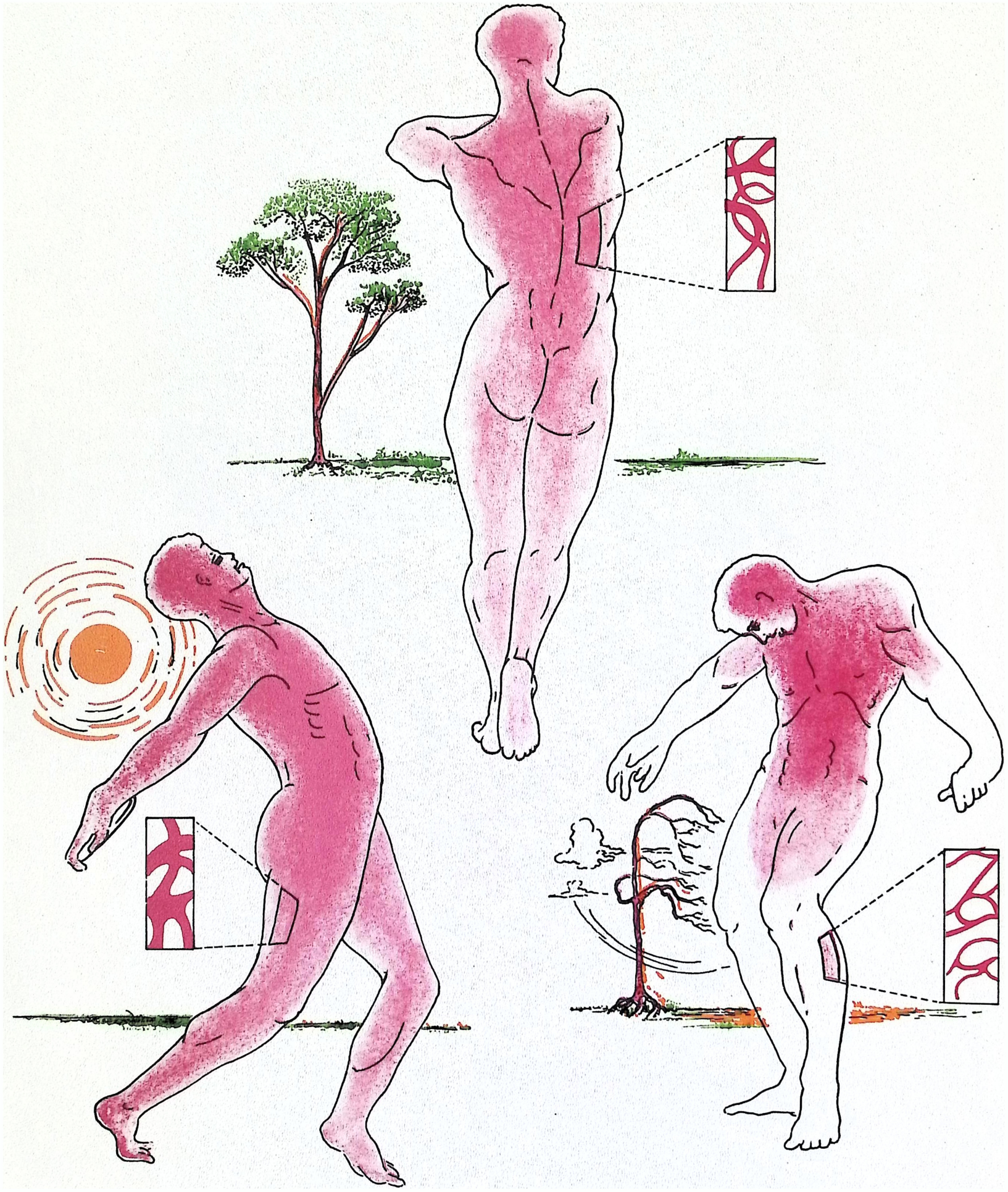
Mechanisms of Heat Loss from the Body



Modes of Heat Transfer

Under the ordinary conditions of everyday life about 60% of total loss of heat from the body is accounted for by the process of radiation. Convection of course depends on air temperature and rate of movement, but in ordinary room conditions in a resting state a patient loses about 15% of his total heat loss by this means.

Vaporization of water is not dependant on the secretion of sweat entirely, since fluid moving out of the peripheral capillaries seeps into the epidermis from which it passes to the environment in accordance with the existing laws of vapour pressure of the atmosphere. This fluid loss accounts for from 22 to 27% of the total heat loss under ordinary conditions.



Zones of Vasomotor Control

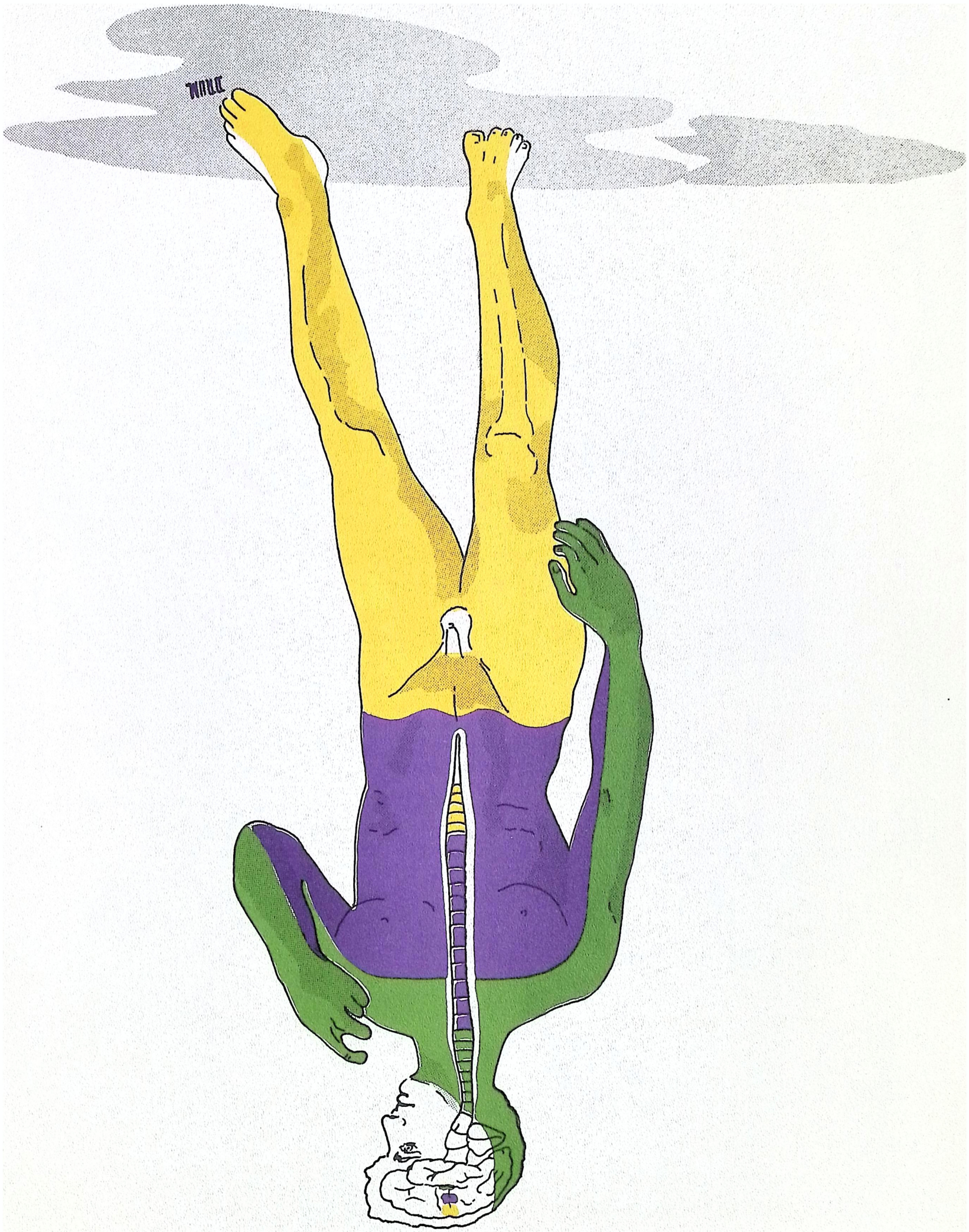
In ordinary room temperatures and resting metabolic rates, heat moves from the surface of the skin to that environment in a well defined manner maintaining this surface at a temperature level considerably lower than internal temperature. It follows therefore, that immediately below this surface there is an area of tissue which will exhibit a progressive increase of temperature with increase in depth until the level of internal temperature is reached. This area is called the internal temperature gradient.

It is the study of this gradient, estimating the depth, and the reasons for its existence, which are of primary interest to us in our system of skin temperature analysis.

Experiments conducted by Winslow, Herrington & Gagge show that clothed, semireclining subjects are able to maintain an easy balance between heat production and heat loss by the vasomotor control of the rate and volume of blood flowing through the skin in environmental temperatures between 77 to 88 F. This type of thermal regulation is described as being the *"Zone of Vasomotor Control"."*

When environmental temperature drops below 77 F. we find that there is no control of heat loss; the body's internal temperature can be maintained only by chills. The blood vessels of the skin are normally constricted thus the body cools as an inanimate object in accordance with Newton's Law of Cooling which states: the rate of cooling, indicative of the rate of loss of heat, is directly proportional to the difference of temperature between the body and its surroundings. When this condition applies it is described as being a *"Zone of Physical Cooling"* – purely physical factors of heat loss dominate.

When environmental temperatures raise above 88 F. the process of sweating starts, increasing in volume proportionately with temperature. Peripheral blood flow also increases with increase of environmental temperature. Cooling of the body is adequate; the general level of body temperature is higher; pulse rate increases with the increase of temperature. This condition is classified as the *"Zone of Evaporative Cooling* with Vasomotor Adjustment".


WALL

Sensory Control

Conscious awareness of environmental temperature is interpreted in the brain from a pattern of impulses generated in extremely sensitive nerve endings situated just beneath the surface of the skin. This nervous mechanism does not identify external temperature in actual degrees, but rather is designed to monitor the rate at which internal heat is being lost to the environment. Because the body has a certain weight and size it is subject to the same laws of heat transfer as apply to inanimate objects. It is imperative that the quantity of heat generated within the body as a product of cellular activity be held within a very limited range of temperature at all times regardless of the large variance in internal heat production which results from physical activity or an increase in environmental temperatures. Thus, this conscientious recognition of environmental temperature alerts the mind to the intricate interplay proceeding to seek thermal equilibrium between the purely physical processes of heat dissipation and internal heat production. Should heat loss proceed too slowly, due to increased physical activity, or an extremely warm environment, the need is felt to rest from such activities or seek a cooler environment. At the opposite end of this thermal spectrum where heat is lost to a cold environment in greater quantities than it is being produced within the body the desire is felt to reduce the rapid loss by seeking a warmer environment or increasing physical activity, thereby, elevating internal heat production. When physical activity is reduced to a minimum in a relatively cool environment it is interesting to note the physiological adjustments in the rate of blood flow between different parts of the body which are necessary to compensate properly for the different rates of heat loss due to the difference in the effective radiating surface area in relation to internal mass.

In an environmental temperature of 64° Fahrenheit, the unclothed body, at a resting metabolic rate, will exhibit both extremes in the adjustment of blood flow. Because heat is lost more rapidly from the limbs of the body than the trunk, blood flow is reduced to a minimum quantity through constriction of the blood vessels just beneath the skin surface of these parts. In contrast, the trunk of the body, because of its larger mass, loses heat more slowly, therefore the blood vessels of the skin will be found to be in a state of maximum dilation. As either the environmental temperature increases, or some physical exertion is made, it is observed that the involuntary physiological response is a gradual release of the constriction of the blood vessels of the limbs. The fingers and toes, being the most efficient radiators of heat because of their relatively larger surface area to internal mass are utilized to accommodate approximately 60% of the total physiological adjustment to any particular thermodynamic relationship which may be encountered between internal heat production and heat transfer to the environment. This reciprocal action of shifting blood volume between the areas near the surface of the body and the internal organs requires an intricate network of control over the expansion and contraction of the vascular beds in the respective areas.

As we now view the nature of any derangement of neural activity as being an abnormal perversion of appropriate neural response to normal stimulii we see the ramifications which are possible through the expansion of even a single element of control which might be so affected in the vast communication and control network of the single function of maintaining an internal constant temperature.

The course of progress of a localized neuropathy on a spinal level in the vasomotor control system theoretically can proceed along direct pathways to its highest order of abnormal sophistication which is its ultimate debilitation of the highest order of neural integration found at the level of human consciousness in the cerebral cortex.

Such a phenomenon is observed clinically in certain types of psychotic behaviour, where the interpretive centre is depressed in association with other facets of mental derangement. That the neuropathic process takes this particular course of development is of course entirely dependent, as it is in any disease process, on the particular configuration of neural elements which are, by chance or probability, drawn into the orbit of influence of the original process. The phenomenon of reduced sensitivity to temperature is not limited to psychotic degeneration but appears clinically in all diseases to a greater or lesser extent, being delimited to the section of skin enervated by the affected neuromere exhibiting neuropathic behaviour of vasomotor control. Such evidence would tend to validate the hypothesis that the nerve pathways of temperature sense and those which control the rate and volume of blood flow through the skin are synergistic. It is possible that one sensory pathway serves both functions as hypothesized in the following section.

Central Control

Normal body temperature is basically the expression of a thermal equilibrium which is maintained between the varying modes and fluctuations of internal heat production and external elimination. The control centre, not unlike an electric thermostat, upon proper stimulation is designed to actuate certain serialized events which directly modify all factors concerned with internal heat production and its physical transport to the environment.

The human thermostat in addition to sensing temperature changes, represents a highly sophisticated centre for processing data constantly arriving from all parts of the body, which are pertinent to the thermal equation of heat loss. The temperature of the blood arriving at this point is utilized as a gross measurement for the extent of thermal balance between production and elimination.

When internal heat production exceeds the physical capabilities of heat elimination, the blood temperature is elevated. The detection of an increase in blood temperature by the thermal receptors in the brain is identified as being indicative of an increase in the delay in transportation and ultimate dissipation of heat to the external environment. The speed at which blood temperature rises from a "norm" further indicates the speed at which the thermal imbalance is developing. Depending on the rate of this change, the thermoregulating centre acts to modify the behaviour of both general and specific functions directly involved with the transport and dissipation of heat. Such action is a graded response formulated to equalize the immediate and the anticipated deviation in thermal equilibrium in the shortest possible time. Rapidly rising blood temperature, therefore, calls forth a response designed for more rapid compensation than slow rising temperatures.

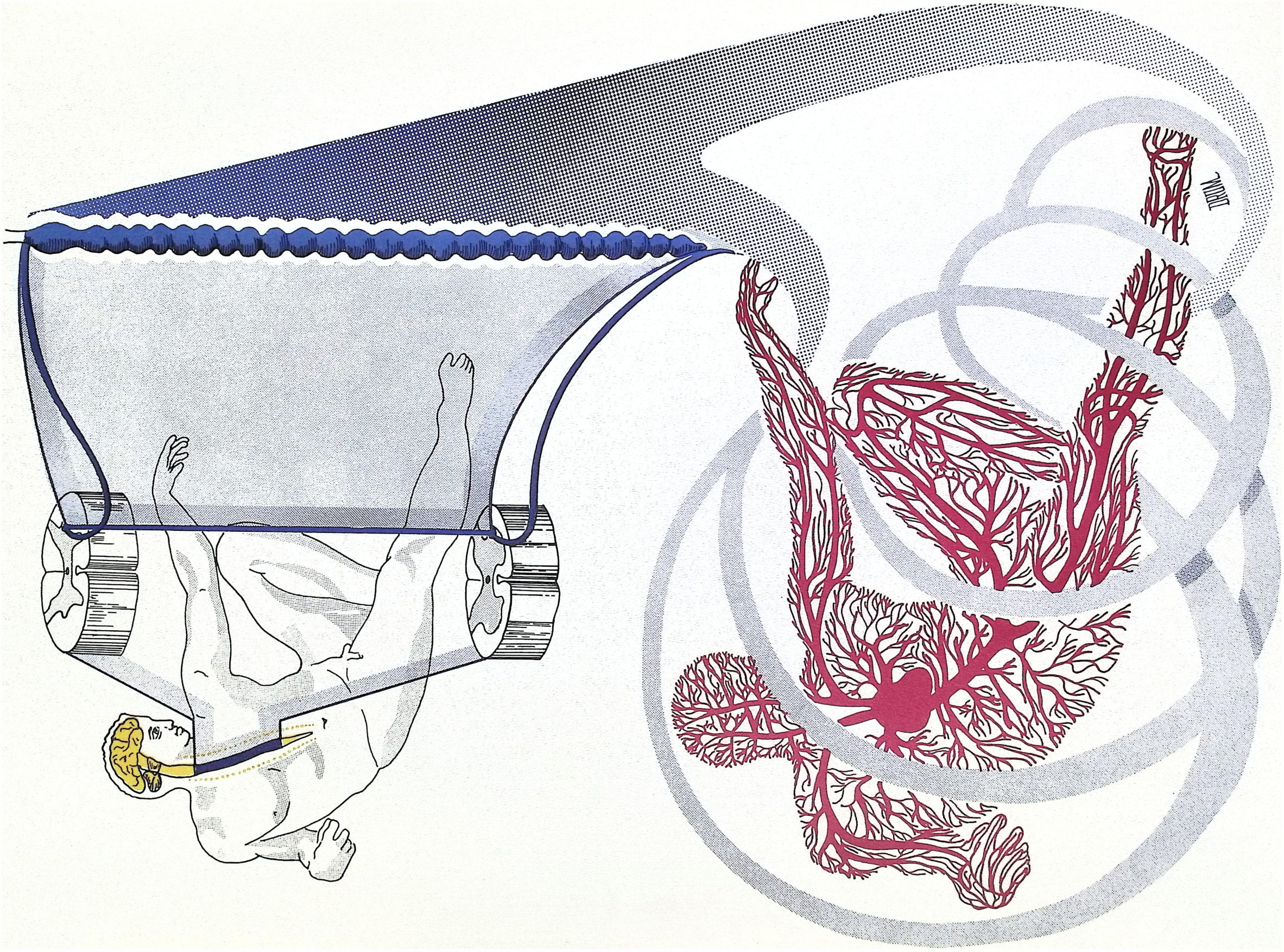
It may be stated as a working hypothesis that an increase in blood temperature "triggers" an established pattern of neural discharges which proceed through higher and lower brain centres to integrate functional activities which facilitate adaptation to thermal stress.

The primary role of cerebral control over the functions regulating heat dissipation is one which establishes the tone of the autonomic nervous system.

Of equal importance is the passage of sensory information regarding the environment, how favorable or unfavorable it may be for absorbing body heat, to the cortex giving awareness to the state of thermal balance.

Cerebral control acts through reflex control on systems which regulate the water-balance of the body, directly through the following avenues:

1. Redistribution of blood – by shifting the fluid concentration from internal regions to the periphery heat loss is facilitated.
2. Controlling variations in blood volume – by varying the blood viscosity the conductivity is varied without sacrifice of function capacity of blood.
3. Controlling circulation rate – To facilitate heat loss the stroke-volume of cardiac output is increased with the pulse rate decreased. Conversely, to conserve heat the stroke volume is reduced with pulse rate increased.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Vascular Innervation - Constriction

The blood vessels of the skin, that is, the small arteries and arterioles leading to the capillary bed are composed chiefly of involuntary muscle fibres arranged in a circular fashion. Like cardiac muscle these muscle fibres are supplied by two types of nerve fibres – classified as inhibitory and/or excitatory. Those which cause constriction of the arteriolar musculature are called vasoconstrictor, those which inhabit, and in consequence cause relaxation of the muscular rings, are termed vasodilator.

The *vasoconstrictor* fibres belong to the thoracio-lumbar (sympathetic) division of the involuntary nervous system. These constrictor fibres arise from groups of nerve cells situated in the lateral horns of the spinal cord, extending in man from the first thoracic to the second or third lumbar segment inclusive. *All the arterioles of the body wherever situated are supplied with filaments whose ultimate source is this relatively limited region of the central nervous system.*

The fibres of the sympathetic system emerge from the cord through the anterior root of the spinal segment in which their cell bodies are placed. In a cross section of the anterior root they appear as fine medullated fibres. They separate almost immediately, however, from the voluntary motor fibres of the anterior root and enter the corresponding ganglion of the sympathetic chain. Thus, the spinal nerves from the 1st thoracic to the 2nd or 3rd lumbar, but not others, are connected each to a vertebral ganglion by a delicate white strand composed of preganglionic fibres and known as the white ramus communicans.

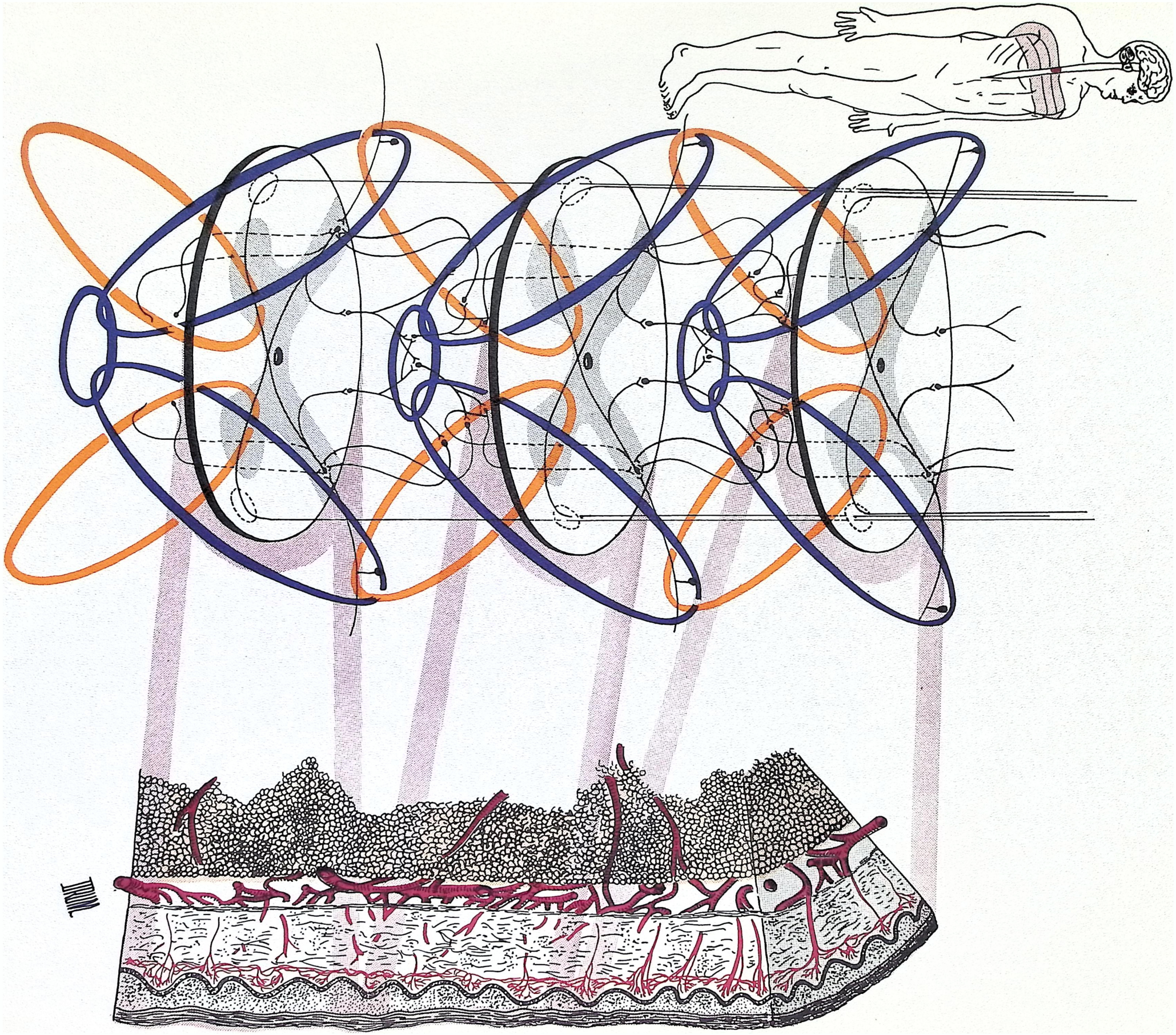
A preganglionic sympathetic fibre, after entering the ganglion, may pursue one of three courses:

1. Form synapsis with cells in the ganglion which it first enters.
2. Pass up or down the sympathetic trunk for some distance to terminate in a ganglion at a level higher or lower than that of the segment from which it originated.
3. Traverse the gangliated cord without interruption to find a cell station in either a prevertebral or a terminal ganglion.

The ganglia of the sympathetic chain are connected with the spinal nerves by delicate filaments called gray rami communicantes. They are composed of the axons of the ganglion cells and are therefore called post-ganglionic. The gray rami in the thoracic and upper lumber regions join the spinal nerves close to the points at which the white rami arise. Their constituent fibres are continued to the periphery for the supply of the blood vessels, sweat glands and smooth muscle of the skin. Whereas, as already mentioned, only a limited number of the spinal nerves possess white rami, every spinal nerve receives a gray ramus.

The peripheral distribution of the post-ganglionic fibres follow the course of the larger arteries, supplying short sections of these vessels with single axons which terminate in the muscular layer of the vessel.

Experimental research has shown the pattern of distribution of post ganglionic fibres has no correlation to the segmental position of the pre-ganglionic cell body in the lateral horn of the cord. Although it is known that there are sympathetic dermatomes in man, these do not correspond to the well-known sensory dermatomes.



Vascular Innervation - Dilatation

The sensory fibres, through which the antidromic impulses of vascular dilatation are conveyed, are distributed anatomically on a segmental level throughout the length of the spinal cord through each posterior division of each spinal nerve.

It becomes evident that segmental skin temperature differentials represent zones in which, because of reduced dilating tone, the vasoconstriction of the blood vessels of the skin is seen to dominate in the affected area. This cannot be explained satisfactorily, either in terms of a simple block to the transmission of the impulse, or, of a simple stimulation through abnormal irritation. If this were so, one would expect to note gross sensory disturbances accompanying the segmental skin temperature reduction. No such loss of sensation or abnormal sensation is normally observed. Further, it can be demonstrated that the neurological reflex responsible for producing the "red-flare" reaction normally elicited by various forms of mechanical trauma can be evoked within the area where the functional integrity of dilating control has been lost. Such evidence would indicate that the affected neurone is basically physiologicially intact...that only the spectrum of its normal range of response to fine increments of functional adaptation is reduced leaving the mechanism responsive only to a more gross range of activity.

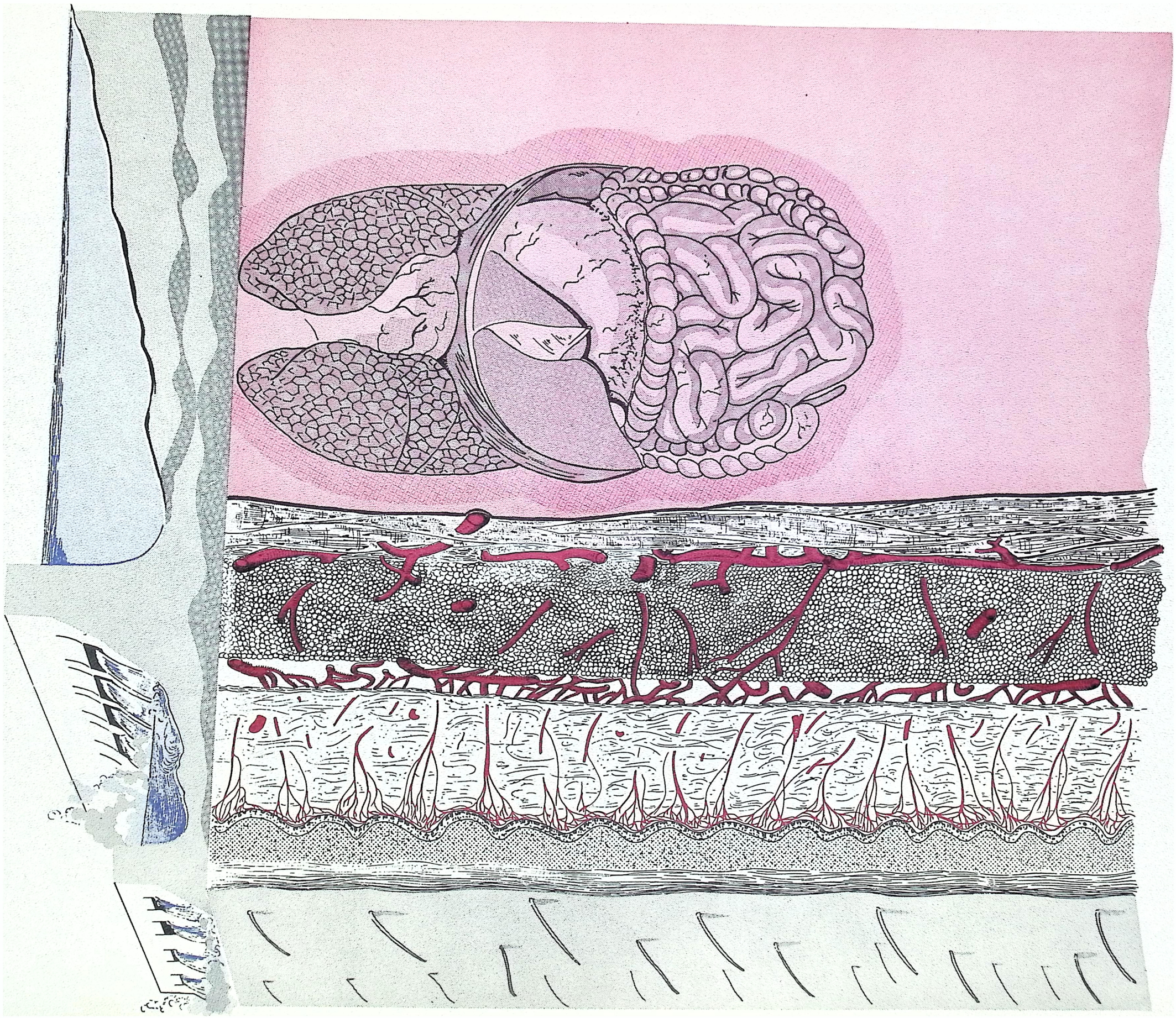
A detailed analysis of the neurological architecture of the probable inter-spinal connections of nerve fibres associated in the control of appropriate dilating response to temperature changes of the body will illustrate the basic elements which must be involved if this type of phenomenon is to be explained.

It has been estimated that approximately 40% of all fibres travelling in the posterior root of each spinal nerve are capable of transmitting efferent impulses backwards to the periphery from the spinal root ganglion. Although it is presently not known whether the antidromic impulse is conducted over fibres subserving some other function, our clinical observations would seem to indicate that this is so.

It is apparent that the fibres mediating pain impulses, because of their relatively high stimulus threshold, and the more direct course they take, with few internuncial connections, upward to higher brain centres are not involved with the transmission of the dilating impulse. More likely, only the smaller type nerve fibres which have lower threshold of response to stimulii, mediating such sensations as touch and temperature, are involved in antidromic transmission. These fibres upon entering the spinal cord from the lateral division of the posterior root, divide into an ascending and descending branch which pass to levels immediately adjacent where they make connection with internuncial neurons forming intricate and oftentimes indistinct interconnection with unilateral and bi-lateral divisions of the reflex mechanism. Together with these fibres there are neurons which pass more

directly to the opposite side of same segmental level of which they enter the cord. This design of neuron distribution has been identified through surgical experimentation as the best approximation of the known inter-segmental pathway serving the functions of various modes of sensation which show a high degree of peripheral localization. Incidentally, such localization is identical to the same distinct localization of dilating tone. Until the neurological pathways of vasodilatation are isolated, if it is possible such a feat can ever be accomplished, this design will adequately explain the neural mechanism of vasomotor control of dilatation.

The most distinct feature of vasodilatation is the functional evidence that any one spinal level is not capable of itself to elicit and antidromic response capable of dilating the blood vessels of the skin supplied by that segment. It is necessary for each spinal level to so integrate its incoming sensory data with similar elements of associated neural mechanisms above and below itself as well as with the opposite side of the body on its own level before the antidromic reaction can be produced. Neural control mechanisms of this type indicate a high order of temporal summation of incoming impulses with each link of the intersegmental control in order to bring about the highest order of appropriate local control or sensory awareness. It is evident that any deviation in the accurate timing, or distortion of the "memory" of impulse firing pattern for a given stimulii configuration will change the central confluence of incoming impulses, in such a way that the affected elements of the "neural linkage" shall fail to function. Analysing the probable neural mechanism in this way it could be predicted that any malfunction of even the smallest "link" in the chain of neural events associated in control of vasodilation would send out evidence of its existence by its failure to dilate the vessels of the skin directly under its control. The affected area of skin could lose its dilating tone in a sharply segmentalized manner if this is an accurate description of the mechanism of the antidromic impulse and vasodilatation.



Thermal Gradient

Heat flows from the interior regions of the body outward to the cooler exterior environment. To conceive of the intricate interplay existing between purely physical modes of heat transfer and its physiological regulation, one may view the process by analogy.

The internal regions of the body may be visualized as an area which exhibits a high degree of uniformity and constancy of temperature maintained within an extremely narrow range of deviation from a normal of 98.6^{0} Farenheit. This area, appropriately identified as the "thermal core" of the body, may expand in size to include the tissues just beneath the surface of the skin if the environment is warm. Conversely, the thermal core may be reduced in size wherein its outer limits reach only to the deeper portions of the musculature of the body if the environment is extremely cold. Between the thermal core of the body and the external environment there are two distinct anatomical barriers, the skin and the subcutaneous fat, which act as purely physical insulators or dams against the equally purely physical transport of heat moving from the thermal core via conduction through the tissues to the periphery. The rate at which heat flows by the process of conduction is greatly dependent upon the resistance offered by these tissues. But heat flow is not solely dependent upon this resistance, or conductivity, of the tissues. By analogy, just as water will run downhill, always flowing to the lowest possible level, so heat, if left to itself, flows down the temperature hill, always warming the cold objects at the expense of the warmer ones. The rate at which heat flows therefore, depends on the steepness of the temperature hill as well as on the properties of the material through which it has to flow. The difference of the temperature per unit distance is called the temperature gradiant; in analogy to the idea of steepness of grade, which determines the rate of flow of water. It is evident that the body cannot depend on the external environment to be always at a temperature which would establish the appropriate steepness of this thermal gradient to accurately accommodate the changing quantities of internal heat production. The need to adapt to rapid changes in the relationship between internal and external temperature produces a physiological response in the redistribution of the water content of the tissues by circulation of blood.

Blood vessels, arising primarily from the muscles of the body, send perforating branches through the subcutaneous fat layer to the capillary bed which lies just beneath the surface of the skin. These arterioles are analogous to the sluice gates which can be opened or closed to regulate the flow of water through a dam. The rate and volume of blood permitted to flow through the subcutaneous fat is regulated by simple vasoconstriction and vasodilation of the vascular network of the skin. The opening or closing of these blood vessels mechanically regulates, via the functional process of forced convection of the blood stream, the volume of heat capable of passing into this area and hence, to the environment.

The sluice gate effect is achieved in the epidermis, or outermost layer of the skin, by virtue of the fact that the conductivity of this layer varies proportionately with its water content. When, by means of vasomotor control, the blood flow through the capillary bed at the base of the epidermis is increased, the water content of the epithelial cells increases. As the water content of the tissues increases, the rate of conductivity of the tissues increases, thereby, allowing a more rapid transport of heat through this most superficial layer. By contrast, when blood flow is diminished by vaso-constriction the water content of the epidermis is reduced causing these cells to become a most effective heat insulator.

The significance of the "sluice gates" of vasomotor control of thermoregulation, to the chiropractor, is that their "settings" are controlled by the nervous system. To measure skin temperature, the thermal gradient and the physical as well as the physiological reasons for its existence enables one to judge the efficiency of the vasomotor control system. To be able to judge whether this system is functioning normally or abnormally in various areas of the body enables the chiropractor to evaluate the segmental integrity of the nervous system in action.

Segmental Neuropathy of Kinesiology

The mutual relation of body mechanics and nerve function has been recognized for many centuries. Most of the healing professions have recognized this in varying degrees. The psychologists recognize total body flexion with regression into the embryonic posture as a grave problem. Even the casual psychologist recognizes the erect aggressive posture as that of positive successful action. The slumped dejected posture of defense generally implies negative stasis. Orthopedic surgeons, osteopaths and chiropractors have been doing increasing investigation into the details of this problem.

POSTURE

Posture can well be defined as a "spatial adaptation of the human body to its environment". A portion of this environment is the force of gravity against which our muscles are in constant antagonism. The only way one can achieve a zero gravity conflict is either to be almost totally immersed in water or else floating in space. Neither is practical. Our adaptations to the force of gravity are influenced greatly by psychological attitude already mentioned as well as by the mechanical adaptability within the neuromuscular operation of the skeletal structure. The pain of an acute subluxation or of an acute partial disc herniation will force a person into a bizarre posture to minimize pain. Some adolescent individuals are unable to stand fully erect because of inter-scapular pain which may be quite easily correctable with a few adjustments. Others assume the same posture for psychological reasons of conformity to average height. These few generalities open many fields for investigation. One area is the mechanics of articulation between individual vertebrae.

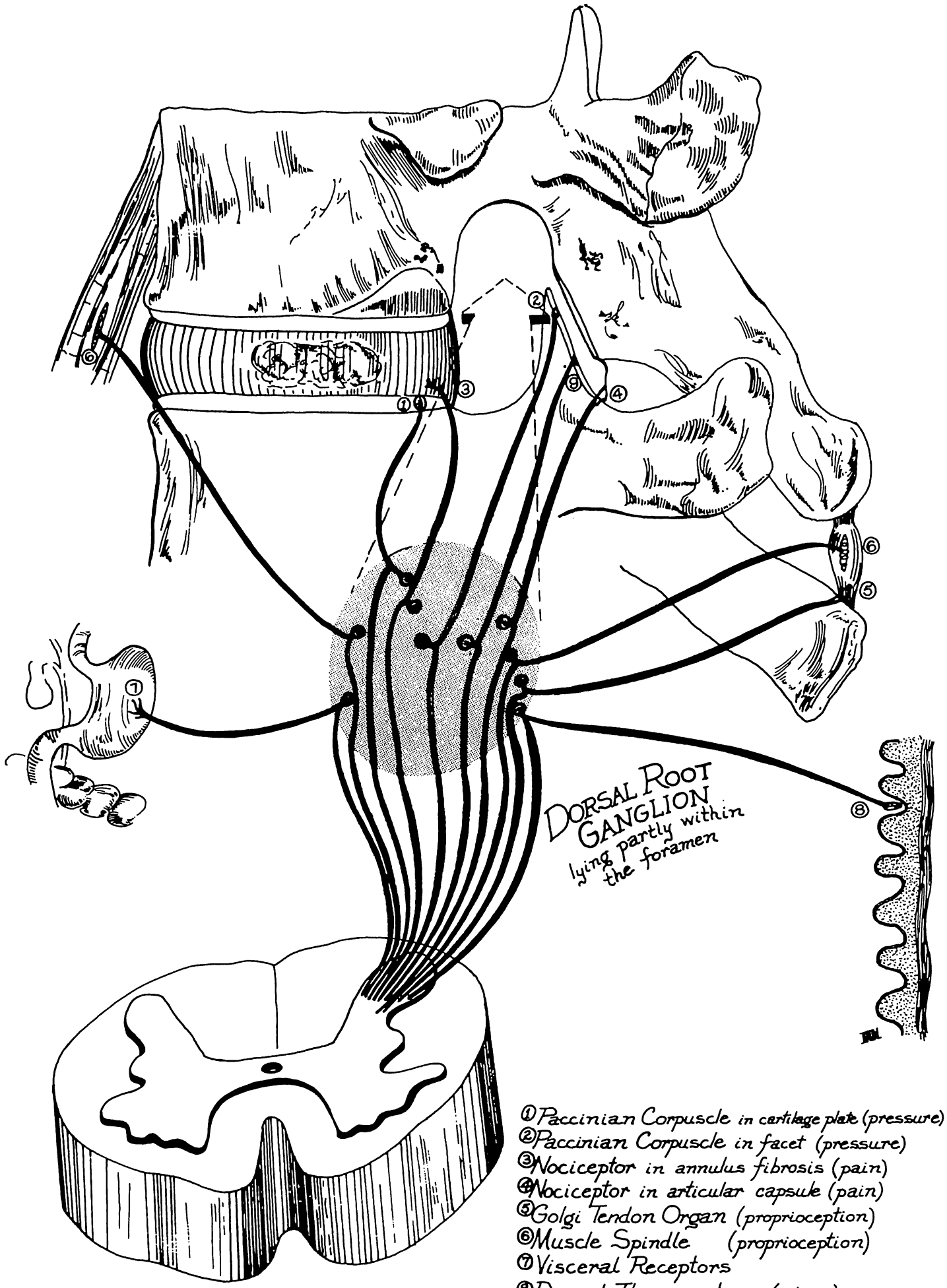
SUBLUXATION

An inter-vertebral subluxation is variously defined and by connotation has assumed different meanings. To the orthopedic surgeon there must be an obvious gross malposition of the articulation though still short of a complete disrelationship (a dislocation). Some still insist that there be demonstrable bone change as a result of this subluxation. By contrast many chiropractors have come to recognize that a nearly microscopic change of position which is accompanied by neural aberration producing muscular imbalance or nearly total rigidity of the articulation can be quite symptomatic. Consequently, many chiropractors at the present time use the word "subluxation" in describing the entire syndrome, the complex of structural and functional changes even though no demonstrable displacement can be measured. This has caused considerable confusion in the related healing arts and insurance fields. Most chiropractors have experienced excellent results by "adjustments" of patients whose spines were completely ankylosed. These individuals occasionally develop the entire symptom complex of a subluxation without any movement of the vertebrae at all. Animals

with immovable intra-pedicular foramina have been artificially subluxated and pathology allowed to develop. These pathologies have reversed and cleared following adjustments and repositioning of the vertebral segments. This would indicate that much of the symptom complex is due to something other than foraminal changes.

Proprioceptive and nociceptive endings in and around the inter-vertebral articulations maintain a normal CONVERSATIONAL TONE of afferent impulses into the cord segment. This is necessary to normal function and the maintenance of all tissues at this level. Splinting a joint for immobilization causes atrophy. In a year of immobility the joint will ankylose and become functionless. Orthopedic surgeons find that broken joints heal much faster with daily movement. Immobilized joints become increasingly stiff. Sudden perversion of this normal CONVERSATIONAL TONE of sensations will cause malfunction just as a disturbance at the entrance of an auditorium will disrupt a good lecture. If the cry of FIRE is repeated a violent pandemonium can occur and hundreds may be killed in the stampede. Likewise a violent neuropathy can arise if the appropriate perverted impulse strikes a receptive host. Such a neuropathy can become a sudden fever, a prolonged gastritis with eventual ulceration or even a dramatic anaphylactic shock and death. Foraminal changes can upset this normal CONVERSATIONAL TONE easily by disturbing sensory endings and cell bodies in the dorsal root ganglion lying within the foramen. Hence the pressure on the nerve trunk is only a minor element of etiology.

Local Sensorial Conversational Tone



① Paccinian Corpuscle *in cartilage plate* (pressure)
② Paccinian Corpuscle *in facet* (pressure)
③ Nociceptor *in annulus fibrosis* (pain)
④ Nociceptor *in articular capsule* (pain)
⑤ Golgi Tendon Organ (proprioception)
⑥ Muscle Spindle (proprioception)
⑦ Visceral Receptors
⑧ Dermal Thermoceptors (2 types)
⑨ Ruffini End Spray (proprioception)

TIMING

Additional consideration of vertebral malpositioning arises from the time element in the physiological adaptation of the organism to its environment. In a slowly developing scoliosis over several years there are osseous changes at the foramina with recession of the pedicles so that in a severe scoliosis the pairs of inter-vertebral foramina have almost identical areas but different shapes. An acute subluxation which has been greatly distorted and then not properly re-positioned will slowly undergo a similar series of adaptative changes over the years and become asymptomatic. A sudden reversal or straightening of this spine, therefore, introduces a new unstable pathogenic condition. One of the major problems confronting any chiropractor is the evaluation of the relative importance of the varied aberrations of normal body mechanics. It is common knowledge among chiropractors that a gross mechanical displacement is frequently producing very few symptoms while an almost imperceptible subluxation in excellent mechanical alignment can be initiating a vast complex of serious pathological changes.

Previously in this book we detailed three classes of injury, "nerve insult", which apply directly to three classes of subluxations:

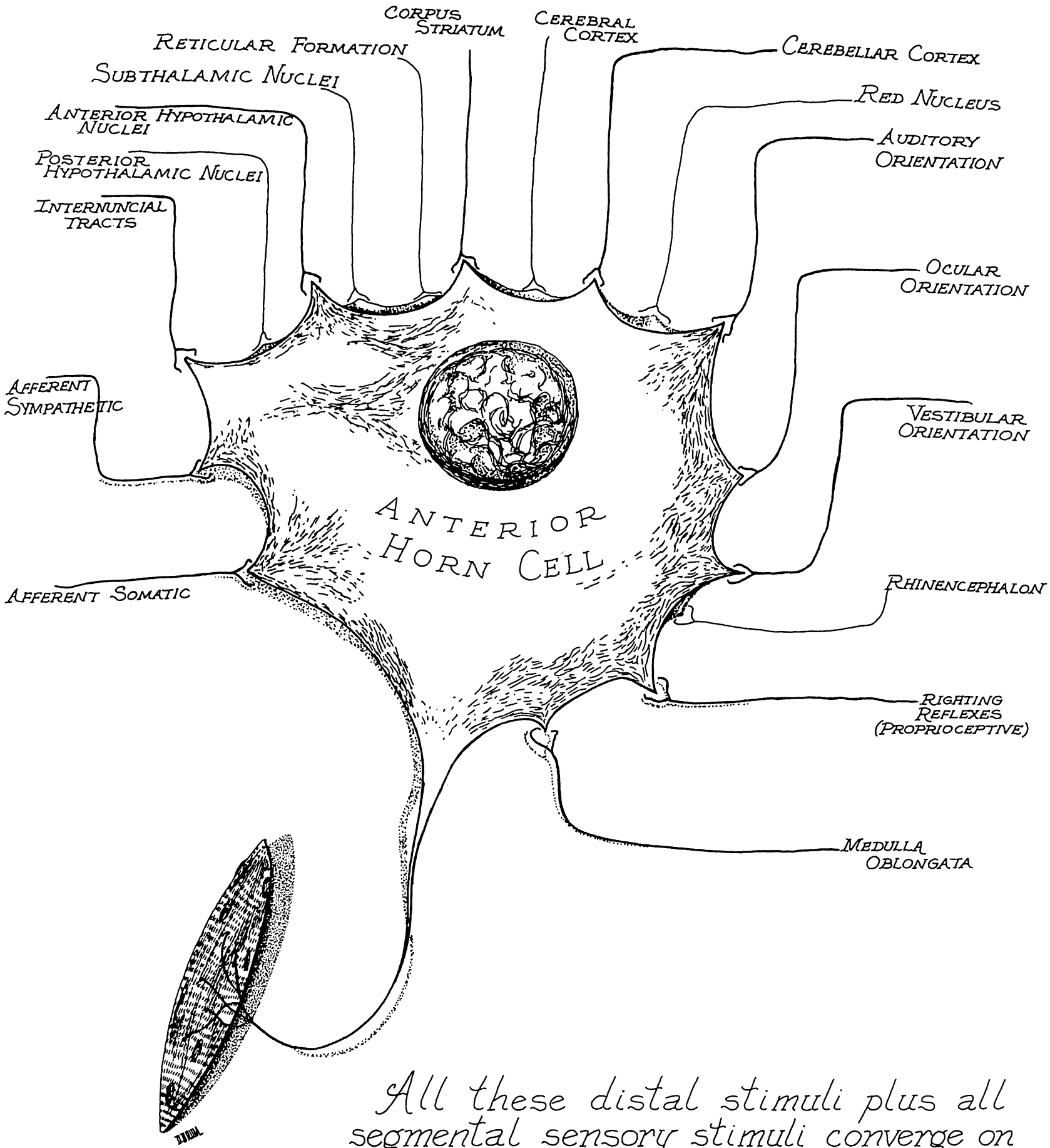
a. a simple sprain of an inter-vertebral articulation which induces almost no neurological upset but only a rapid adaptation and uneventful recovery either "spontaneously" or with minimal care.

b. a sprain, major or minor, which shocks the sensorial CONVERSATIONAL TONE enough to initiate a widespread neuropathy. Circumstances are often such that the neuropathy becomes a vicious, self-perpetuating entity with extensive ramification to continue long after the original sprained articulation has recovered.

c. an adaptative spinal distortion which arises reflexly from the neuropathy previously initiated. This distortion may be symptom-free except for minor local symptoms or it may in turn become a full-fledged symptomatic subluxation initiating additional neuropathy to repeat this b-c, b-c circle.

The comparison and evaluation of degree of this very condition is one of the primary reasons for this entire research program.

Distal Conversational Tone



All these distal stimuli plus all segmental sensory stimuli converge on each single Motor Unit at each segment. The myriad forces influencing the anterior horn cell brought it the name

THE GREAT COMMON EFFECTOR

REFLEXES

Viscero-somatic and somatico-visceral reflexes have been recognized for years and investigated in great detail by eminent physiologists. It has been demonstrated repeatedly and vividly that the constellation of symptoms and pathological changes is almost entirely neurogenic and extremely diffuse, often far from the initial site of injury to the nervous system. It has been shown that the severe shocks to the nervous system as done in a nerve section, novocaine blockade and even by much of the drug therapy is frequently sufficiently drastic to scatter the constellation of symptoms and induce a subsequent pathology which is at times much worse than the original problem. The potency of a light stimulus properly applied is illustrated by the classic example where 10 of 11 cases with quinine resistant malaria responded completely by the disappearance of symptoms and the disappearance of the microrganisms following the very gentle stimulation of the nervous system by withdrawing and re-injecting the cerebrospinal fluid. Hence we find that re-examination of the chiropractic approach to health and disease is quite logical. The many methods of adjusting developed through the past years have each been quite effective although there is a great variation in applicability. With the use of our new monitoring system we are finding that none of these old methods is wrong. However, with our new monitoring system we are able to perceive much more deeply the neurological processes and use the various methods to much better effect. We frequently find that a violently symptomatic subluxation should not be approached directly. Such a direct approach will frequently cause extension of the entire neuropathy even though it may abate some of the local symptoms. These are the conditions which we have previously explained as phases of "retracing". In such cases an indirect approach by successively clearing apparently minor secondary subluxations will result in sufficient overall improvement that the major problem can be approached directly with excellent results. There have been times when as many as thirty different adjustments were utilized in succession over a two hour period of time with the final summation of correction into a complete recovery pattern. Usually there are intervening rest periods so we find the same process spread over several weeks. Attempts at a complete recovery in one day are almost always thoroughly frustrating in that after a certain point has been reached anything further seems to aggravate the whole problem of the neuropathy. A few days later the same approach will bring gratifying results. Therefore, it is imperative that any chiropractor trying to use this method be patient and not try to revolutionize his entire method of practice immediately. This monitoring system should be used for special problem cases at first with the idea that it will not tell us what or how to adjust but will give us an excellent indication of what not to adjust and when to quit.

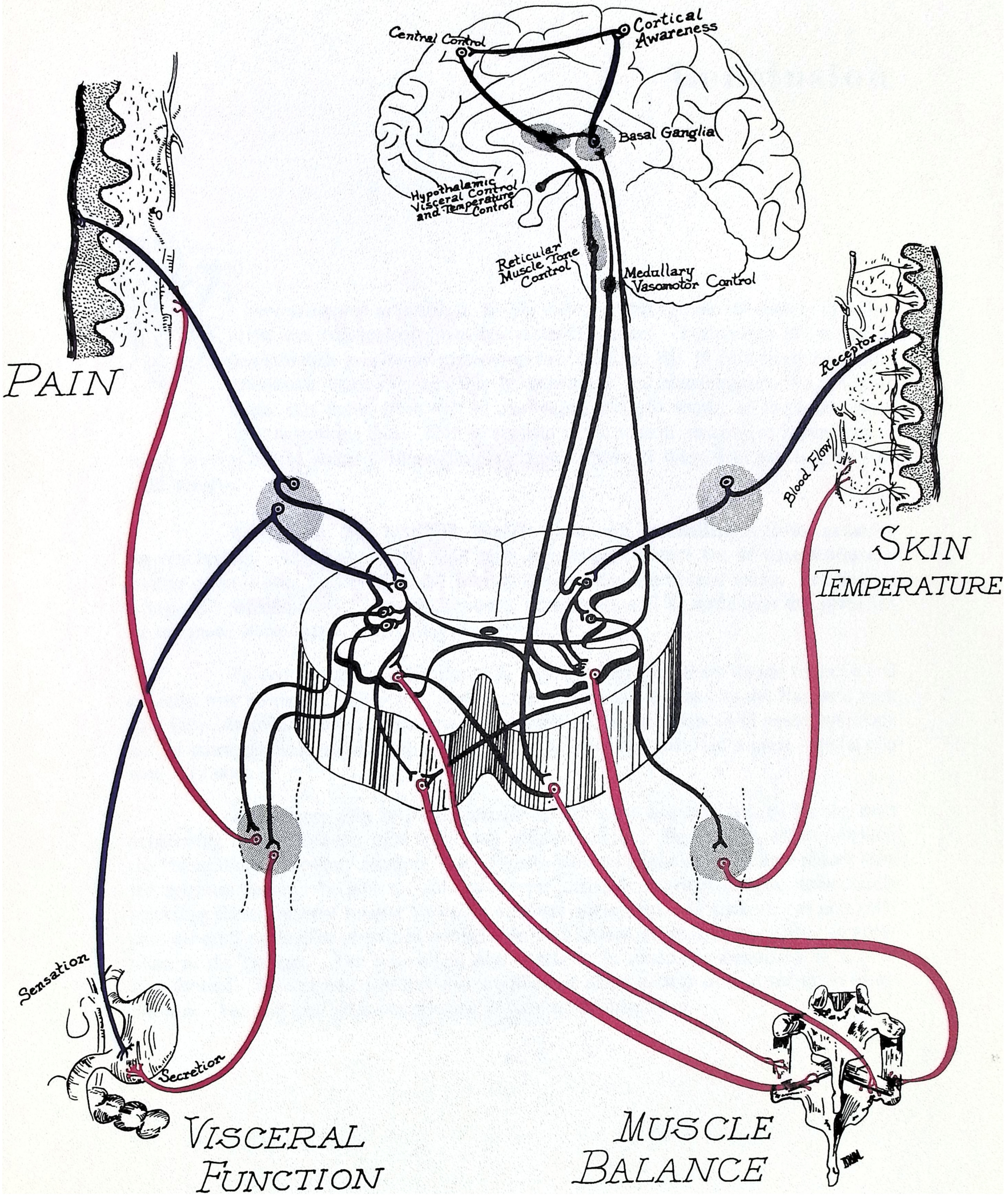
Since a neuropathy is often a self-perpetuating entity of abnormal neurological events it reminds one of the Gordian Knot of Legend. This story tells of King Gordius tying a complex knot with no visible end as a challenge with a magnificent reward. To obtain an end for unraveling the puzzle the victorious youth cut through the knot with his sword to become the world conqueror, Alexander the Great. Frustrating cases tempt us to "cut through the knot" to find a starting point. Chiropractors are fortunate in that the aberration of physiology is still definitely related to body mechanics although the neuropathy may continue long after the original subluxation has subsided and been forgotten. Even though the entire process is quite obscure there is usually a reflex side effect in the form of some disturbance in body mechanics. Management of these inter-related effects fortunately gives us an access point into this vicious circle of self perpetuating pathological reflexes. Thus diligently applied chiropractic care, even though directed to a minor facet of the entire problem, is entirely capable of appreciably changing the neuropathy if intelligently pursued. Thus we find that instead of having to cut the rope in the Gordian knot there is always a loose end available to us. The fascinating possibilities of chiropractic when aided by the present monitoring system of vasomotor response is that we have a method of guiding an effective approach from the periphery of the process right to the heart of the neuropathy.

Another facet of the timing is based upon the relative stability or instability of various segments of the total pathological process. A recent single scoliosis based entirely upon a short leg can obviously be approached directly. When the same condition has progressed into a triple scoliosis we find that a direct approach will usually immediately help the lumbar spine but will cause new symptoms to arise in the compensatory scolioses. As the last scoliosis is the least stable it will frequently be fluctuating into and away from symptom production. These unstable processes are usually directly and easily approachable. Therefore, during the entire management of the chronic scoliosis we must consider the various decompensations and the introduction of new instabilities as a temporary factor. This requires careful guidance and is very frustrating. The more thoroughly we can understand the relationship of these various factors, the more successful the total management. The constellation of dysfunctions and symptoms leading to organic pathologies have even greater ramifications and are much more difficult to evaluate. This is precisely how the vasomotor monitoring system is of immense value.

QUALITY of the NERVE IMPULSE

Long ago the gastrocnemius of a young frog was transplanted into the foreleg and given time for nerve regeneration. When the brachial plexus was then stimulated the gastrocnemius did not respond but when the lumbar plexus was stimulated the gastrocnemius contracted in the foreleg concurrent with the hindlegs. In a later experiment a band of skin was raised from around the torso of a young frog and was slipped to rotate 180 degrees. The nerve pathways were not disturbed except to trade peripheral endings. Tickling the frog's back later caused the frog to scratch its stomach while scratching the stomach prompted back scratching. Hence the QUALITY of the nerve impulse -- nerve imagery or "flavour" of the tissue -- supercedes the mandate of the pathway. Even though instrumentation is not sufficiently refined to delineate all this neural mechanism we are certain that QUALITY of the nerve impulse is the primary element of control of structural and functional integrity. Aberration of this control is the fundamental element of the neuropathic process. It has been quite adequately demonstrated that induction of subluxations in experimental animals will produce symptoms in varying complex constellations of neuropathies. It is also true that the induced pathology will reflexly induce other variations in spinal mechanics. This definite neurological linkage between the numerous physiological systems of the body including those of visceral function and neuromuscular skeletal postural control is well established. The elaborate detailing of this inter-relationship is the object of many research projects. We are apparently quite fortunate at this time to have a new indicator which seems to give us a much deeper insight into neural integrity than ever before possible. With that we invite your participation in a much more rapid advance in the understanding of neurophysiology and of chiropractic.

CONFLUENCE of SYSTEMS



Conclusion

We have attempted to introduce the physiological background adequately to understand our conclusions from this research project. Fortunately the technical breakthrough by closely monitoring two variables has in fact given us results previously denied as possible by physicists and physiologists. We are quite aware that these areas will be challenged and will require us to present much more supporting data. This is planned in the form of successive appendices of which several can be added to this expanding binder. Some of these data will be from your field reports.

As with any new scientific advance there will be challenges to the authority for conclusions. The bibliography lists much supporting evidence but we cannot progress forever on well-worn highways. Trail blazing must be done in several areas. For this we accept full responsibility. Undoubtedly many refinements will be made over the years but we are proud of the status of our present endeavor.

To you who are now joining us in this investigation please do not expect a bed of roses with no thorns. This work does become frustrating at times as did Edison's work with lamp filaments. Our enthusiasm and joy in advancing the sciences of neurophysiology and of chiropractic is making the effort justifiable. You too will find a great satisfaction with this work.

In summary this is a presentation of the most accurate and by far the most penetrating insight into the total individual neural integrity. We are thus able to explain the "miraculous" recovery which at times follows minimal adjusting in an area remote from the symptom center. We now are able to see the collapse of neural integrity immediately preceding the occasional relapse following a normal adjustment. As such we can now compare all prior evaluation of patient management with myriad diagnostic procedures to stumbling in the twilight. The searchlight now available in vasomotor monitoring is a great leap forward. We welcome you into this trailblazing effort to help in a united effort of refinement. You will find great satisfaction in your accomplishments.

References

The lead paragraph in italics that opens the first section of this book, "The Science of Chiropractic", was contributed by the Founder of Chiropractic, D. D. Palmer. It was written at the turn of the century, and is one of the many contributions he has made to science.

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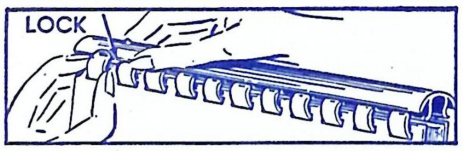
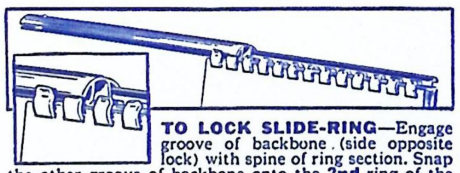
PLASTIC SLIDE RING
DIRECTIONS FOR SHEET CHANGES



TO OPEN SLIDE-RING—Snap first ring (at backbone lock) out of groove, then slide backbone off.



TO LOCK SLIDE-RING—Engage groove of backbone (side opposite lock) with spine of ring section. Snap the other groove of backbone onto the **2nd** ring of the ring section. Then—

—slide the backbone onto the ring section as far as it can go. Finally, snap the first ring into the backbone groove between the lock and the end.